



# Work Seamlessly and Productively with Modern Test Workbenches

Test, analyze, and share collaboratively

With the advent of the artificial intelligence-driven digital age, remote learning technology spending has surged, with double-digit percentage growth year over year. This transformative era has prompted universities and colleges to recognize the pivotal role of robust remote learning infrastructure in adapting to new educational paradigms.

According to Ipsos for the World Economic Forum survey, 72% of respondents from 29 countries expect a hybrid model of higher education, with in-person and online learning, by 2025. Even in electronics teaching labs, a real need exists for technology that requires students and educators to test, analyze, and share results collaboratively.

#### Global remote learning technology market trend:

- The market will experience an estimated growth of 14.7% CAGR between 2023 and 2033. <sup>1</sup>
- Most universities struggle to adapt to the new environment, seeking blended learning experience with the right technology.
- In 2025, higher education will be a hybrid of in-person and online learning. <sup>2</sup>



1. Remote Learning Technology Spending Market by Software, Services, Learning Mode, End User & Region | Forecast 2023 to 2033. N.d. Future Market Insights. REP-GB-12538. <https://www.futuremarketinsights.com/reports/remote-learning-technology-spending-market>
2. Whiting, Kate. "Is This What Higher Education Will Look Like in 5 Years?" World Economic Forum. November 25, 2020. <https://www.weforum.org/agenda/2020/11/higher-education-online-change-cost-covid-19/>

# Keysight Solution

The Keysight Smart Bench Essentials Series teaching lab equipment is affordable and modern. It works seamlessly with Keysight PathWave software, enabling you to test, analyze, and share results collaboratively, across the room or around the world. The differentiated Keysight Lab Manager software allows you to configure your lab with the click of a button and manage all your lab assets effortlessly. With remote learning becoming the new normal, Keysight Digital Learning Suite software enables you to access your lab equipment, even from home. It also comes with KeysightCare, which provides access to technical experts from Keysight and a 24/7 knowledge center to help you get up to speed in the shortest time.



# Keysight Smart Bench Essentials Series

Many test equipment vendors do not have a complete portfolio of products for their teaching lab solutions. They mix and match models, resulting in a mix of different looks, graphical user interfaces, and connectivity. Keysight Smart Bench Essentials Series is a modern design solution for test workbenches in teaching labs, as well as for aspiring new product development electronics engineers.

When testing your device, you need a complete portfolio of test instruments to perform specific functions:

- The power supply should provide the exact DC biasing power to your device under test (DUT). Otherwise, it will not operate properly.
- The function generator should provide the various test input signals for your DUT to respond. The output signals from your DUT are the responses to your stimulated test input signals.
- The oscilloscope measures the dynamic responses of your DUT output signals. The digital multimeter measures various parametric responses from the DUT, directly or indirectly. Those responses include DC voltage or current consumed by the DUT and temperature changes of the DUT.

Figure 1 shows how all the instruments work together to test your DUT. However, there is more to how each instrument performs its primary functions.

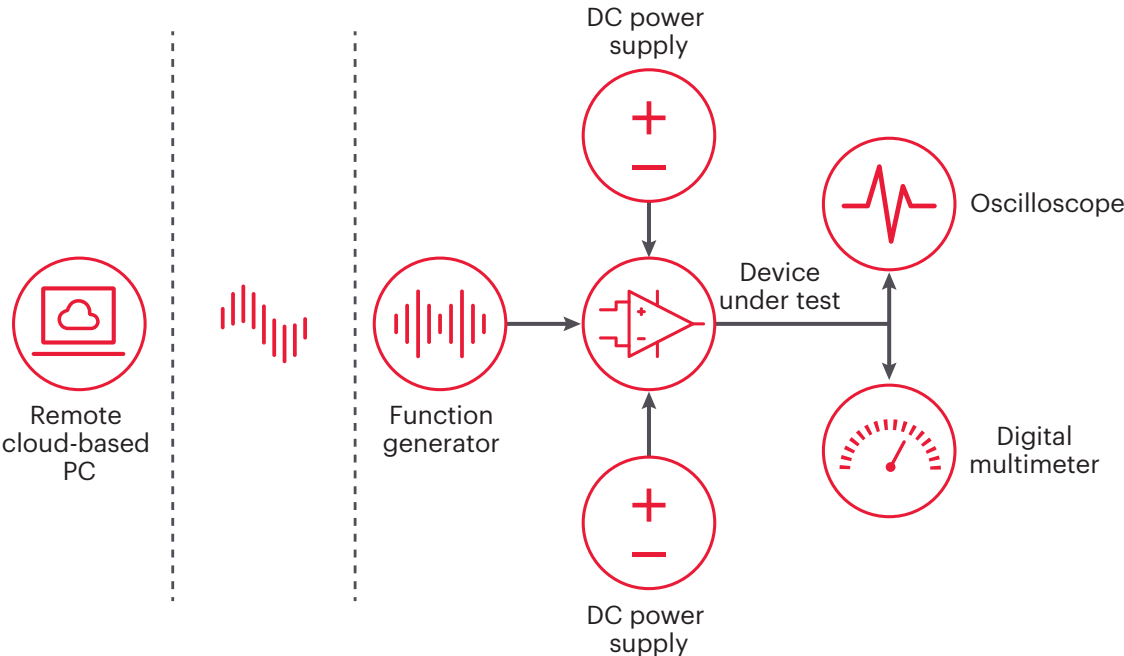


Figure 1. Smart Bench Essentials Series instruments work together to test the DUT



Many teaching labs have limited workspace and workbenches that have test instruments with inconsistent user interfaces and connectivity. Keysight offers a complete portfolio of instruments with a common user interface and software, allowing students or electronics engineers to do more directly or remotely from anywhere, at any time.

## Connected to your next innovation

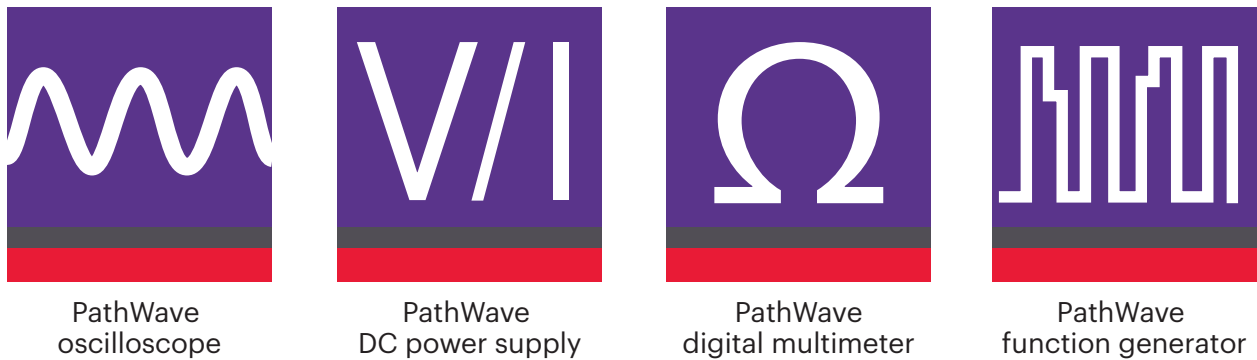
The Smart Bench Essentials Series makes your work easier and more intuitive. All four instruments come with a 7-inch liquid crystal display with intuitive soft buttons and a consistent graphical user interface. The color coding for each channel is uniform among the instruments.



Figure 2. Large screen with a consistent and intuitive graphical user interface

## Connected to each other

The Smart Bench Essentials Series helps you accelerate your work with a connected bench. The instruments come with PathWave BenchVue software applications to help you easily configure your instruments, operate them on the same PC screen to test your DUT, capture all the data, and share results with your peers. You can also store all your data on a PC and export the information in common readable formats for post-analysis work and report generation. The instrument hardware and software help you work seamlessly and productively.



**Figure 3.** PathWave BenchVue software applications for the Smart Bench Essentials Series

## Connected to the lab

Many work or teaching labs have a mixture of old and new instruments that are not interconnected. Users configure each bench manually on the front panel of each instrument. Setting up each instrument configuration individually in a teaching lab with 10 or more benches quickly becomes cumbersome and unproductive.

Keysight Digital Learning Suite software works seamlessly with the Smart Bench Essentials Series instruments to perform the following functions:

- The lab configuration tool enables you to arrange the lab layout, number of benches, type and number of instruments, and name of the benches according to the lab layout.
- The lab administration tool lets you monitor the status of all the bench instruments in the lab and send instrument configurations to selected instruments. You can reset all instruments in the lab to the default configuration if necessary.
- The asset tracking tool allows educators to intuitively manage a long list of lab assets, including instruments, equipment, and accessories. This function also helps you track calibration due dates for all your instruments.
- The mass firmware update tool allows educators to update the firmware of their connected Keysight instruments in one click.

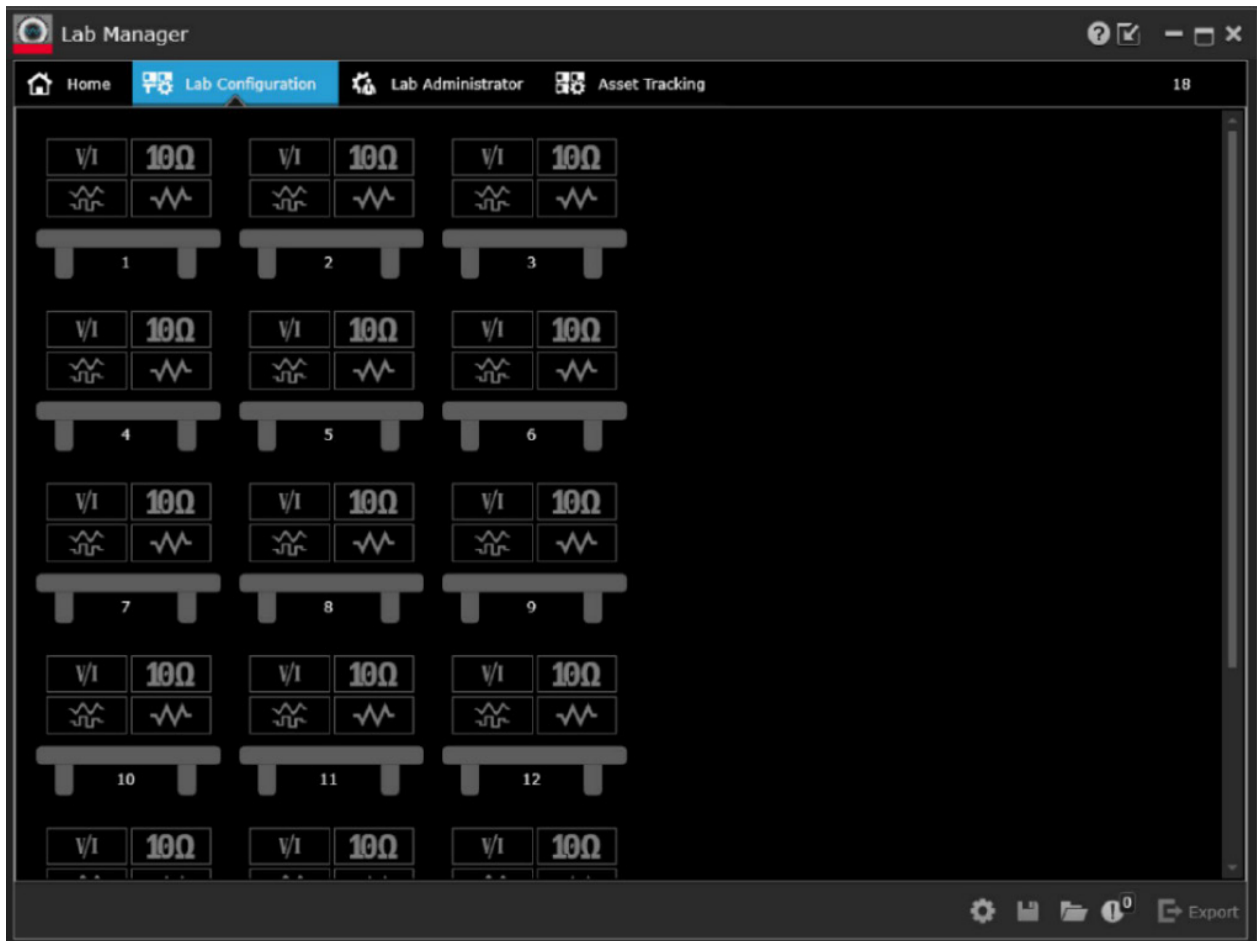


Figure 4. Keysight Digital Learning Suite software

The Digital Learning Suite software helps streamline and simplify lab management, saving lab administrators and educators time. It provides an overview of the connection status of all instruments via a customizable home screen with widget control. It enables administrators to configure the measurement settings of all instruments at once, all from a single admin PC.

## Connected to the cloud

Having mature remote connected technology for higher education is essential as most universities move into hybrid mode. A similar trend is apparent in remote working arrangements across industries.

Keysight Digital Learning Suite software provides a seamless way to move into online learning. This end-to-end solution delivers a complete remote setup of your basic instrument lab and helps you do the following:

- Enable secure, cloud-based remote lab scheduling and session booking that accommodates up to five concurrent remote users per bench PC and a maximum of 50 concurrent users.
- Access lab setups remotely through a centralized control server that manages, monitors, and configures all instruments in the lab.
- Perform lab work remotely through a web browser that controls your industry-grade Smart Bench Essentials Series instruments. Store all your test results in the cloud.
- Collaborate and transfer test data using the Digital Learning Suite software's chat room and a storage file transfer facility.

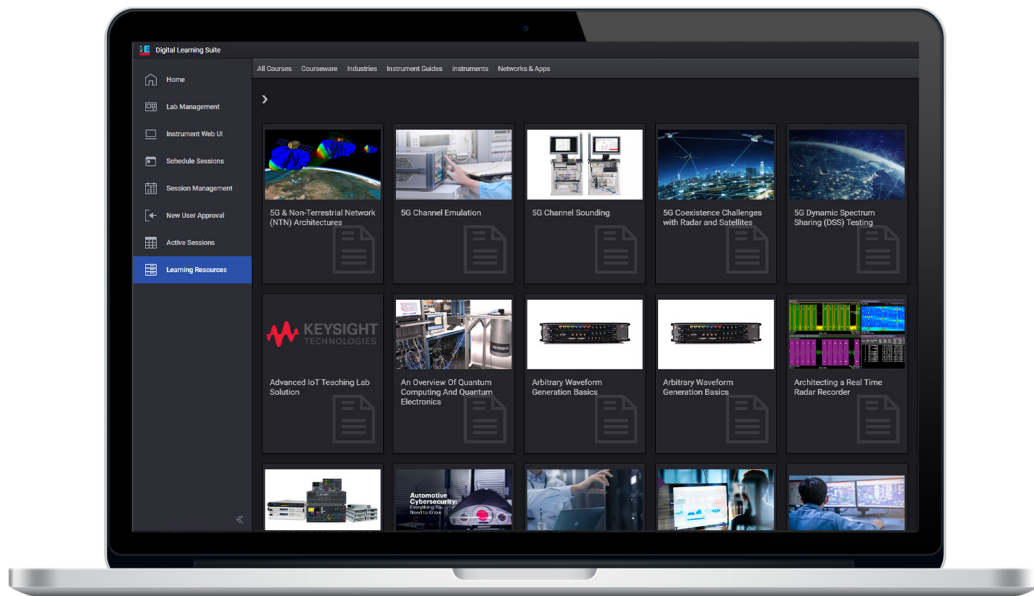


Figure 5. Keysight Digital Learning Suite software



# Conclusion

Keysight Smart Bench Essentials Series' portfolio of bench instruments, Keysight Digital Learning Suite software, and PathWave BenchVue instrument application software provide a complete learning lab or a new working lab solution with smart connectivity to improve your lab experience.

Learn more about [Keysight Smart Bench Essentials Series and PathWave software](#).



**Figure 6.** Keysight PathWave BenchVue software controlling the Smart Bench Essentials Series instruments

Keysight enables innovators to push the boundaries of engineering by quickly solving design, emulation, and test challenges to create the best product experiences. Start your innovation journey at [www.keysight.com](http://www.keysight.com).



This information is subject to change without notice. © Keysight Technologies, 2021 - 2024, Published in USA, July 19, 2024, 7121-1007.EN